



RB-125-RI SEQUENCE LISTING

Sequence File Name: RB125seq.txt

<110> Horwath, K. L. and Myers, K.

<120> Nucleic Acid Sequences Encoding Type III Tenebrio Antifreeze Proteins and Method for Assaying Activity.

<130> RB-125-RI

<140> 09/876,348  
<141> 2001-06-07

<150> 60/210,446  
<151> 2000-06-08

<160> 48

<170> Microsoft Word

<210> 1  
<211> 19  
<212> PRT  
<213> Tenebrio molitor

<223> N-terminal sequence of protein Tm 12.86

<400> 1  
Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys Glu Cys  
1 5 10 15  
  
Gln Gln Val  
19

<210> 2  
<211> 576  
<212> DNA  
<213> Tenebrio molitor

<223> Non-his-tagged, signal plus, Tm 13.17

<400> 2  
gtggatccaa agaattcggc acgagactac taag atg aag ttg ctc 46  
Met Lys Leu Leu  
-15

tgt tgt cta atc tcc ctc att ctg ttg gtc aca gtt cag gcc ctg 91  
Cys Cys Leu Ile Ser Leu Ile Leu Leu Val Thr Val Gln Ala Leu  
-10 -5 1

acc gag gca caa att gag aaa ctg aac aag atc agc aaa aaa tgt 136  
Thr Glu Ala Gln Ile Glu Lys Leu Asn Lys Ile Ser Lys Lys Cys  
5 10 15

caa aat gaa agt gga gtg tcg caa gag atc ata acc aaa gct cgc 181  
Gln Asn Glu Ser Gly Val Ser Gln Glu Ile Ile Thr Lys Ala Arg  
20 25 30



Glu Thr Glu Lys Ile Ile Asn Lys Cys Ala Val Lys Arg Asp Thr Val  
 80 85 90

Glu Glu Thr Val Phe Asn Thr Phe Lys Cys Val Met Lys Asn Lys Pro  
 95 100 105 110

Lys Phe Ser Pro Val Asp  
 115

<210> 4  
 <211> 116  
 <212> PRT  
 <213> Tenebrio molitor

<223> Mature Protein for Tm 13.17

<400> 4  
 Leu Thr Glu Ala Gln Ile Glu Lys Leu Asn Lys Ile Ser Lys Lys Cys  
 1 5 10 15

Gln Asn Glu Ser Gly Val Ser Gln Glu Ile Ile Thr Lys Ala Arg Asn  
 20 25 30

Gly Asp Trp Glu Asp Asp Pro Lys Leu Lys Arg Gln Val Phe Cys Val  
 35 40 45

Ala Arg Asn Ala Gly Leu Ala Thr Glu Ser Gly Glu Val Val Val Asp  
 50 55 60

Val Leu Arg Glu Lys Val Arg Lys Val Thr Asp Asn Asp Glu Glu Thr  
 65 70 75 80

Glu Lys Ile Ile Asn Lys Cys Ala Val Lys Arg Asp Thr Val Glu Glu  
 85 90 95

Thr Val Phe Asn Thr Phe Lys Cys Val Met Lys Asn Lys Pro Lys Phe  
 100 105 110

Ser Pro Val Asp  
 115

<210> 5  
 <211> 481  
 <212> DNA  
 <213> Tenebrio molitor

<223> Non-His-tagged, Signal plus, Clone 2.2

<400> 5  
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 Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala  
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atc gtc atc gga gct cag gct ctc acc gac gaa cag ata cag aaa 91  
 Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys

-5	1	5	
agg aac aag atc agc aaa gaa tgc cag cag gtg tcc gga gtg tcc			136
Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val Ser			
10	15	20	
caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gat gat			181
Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp			
25	30	35	
ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act gga			226
Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly			
40	45	50	
gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa gcc			271
Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala			
55	60	65	
aag ctg aag cat gtg gcc agc gac gaa gag gtg gac aag atc gtg			316
Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val			
70	75	80	
cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct tat			361
Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr			
85	90	95	
gac acc ttc aag tgt att tac gac agt aac cct gat ttc tct cct			406
Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro			
100	105	110	
att gat taa ttgttttgta ttgactgaa ttttgacaat aaaggaata			455
Ile Asp			
115			
tcgttatgta aaaaaaaaaa aaaaaa			481
<210>	6		
<211>	482		
<212>	DNA		
<213>	Tenebrio molitor		
<223>	Non-His-tagged, Signal plus, Clone 2.3		
<400>	6		
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Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala			
-15	-10		
atc gtc atc gga gct cag gct ctc acc gac gaa cag ata cag aaa			91
Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys			
-5	1	5	
agg aac aag atc agc aaa gaa tgc cag cag gtg tcc gga gtg tcc			136
Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val Ser			
10	15	20	

caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gac gat 181  
 Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp  
 25 30 35  
  
 ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act gga 226  
 Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly  
 40 45 50  
  
 gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa gcc 271  
 Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala  
 55 60 65  
  
 aag ctg aag cat gtg gcc agc gac gaa gaa gtg gac aag atc gtg 316  
 Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val  
 70 75 80  
  
 cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct tat 361  
 Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr  
 85 90 95  
  
 gac acc ttc aag tgt att tac gac agt aaa cct gat ttc tct cct 406  
 Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys\*Pro Asp Phe Ser Pro  
 100 105 110  
 att gat taa ttgttttgta tttgactgaa ttttgacaat aaaggtacta 455  
 Ile Asp  
 115  
  
 tcgttatgaa aaaaaaaaaa aaaaaaa 482

<210> 7

<211> 133

<212> PRT

<213> Tenebrio molitor

<223> Precursor Protein for Tm 12.84, Clones 2.2, 2.3, and 7.5

<400> 7

Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala Ile Val Ile Gly Ala  
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Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys  
 1 5 10

Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val  
 15 20 25 30

Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu  
 35 40 45

Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn  
 50 55 60

Val Glu Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu  
 65 70 75

Val Asp Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu

80 85 90  
 Glu Thr Ala Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp  
 95 100 105 110  
 Phe Ser Pro Ile Asp  
 115

<210> 8  
 <211> 115  
 <212> PRT  
 <213> Tenebrio molitor

<223> Mature Protein for Tm 12.84, Clones 2.2, 2.3, and 7.5

<400> 8  
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 1 5 10 15  
 Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val Arg Thr  
 20 25 30  
 Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu Cys Phe  
 35 40 45  
 Ser Lys Lys Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu  
 50 55 60  
 Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp  
 65 70 75 80  
 Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr  
 85 90 95  
 Ala Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser  
 100 105 110  
 Pro Ile Asp  
 115

<210> 9  
 <211> 481  
 <212> DNA  
 <213> Tenebrio molitor

<223> Non-His-tagged, Signal plus, Clone 3.4

<400> 9  
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 Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala  
 -15 -10  
 atc gtc atc gga gct cag gct ctc acc gac gaa cag ata cag aaa 91  
 Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys  
 -5 1 5

agg aac aag atc agc aaa gaa tgc cag cag gtg tcc gga gtg tcc 136  
 Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val Ser  
 10 15 20

caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gac gat 181  
 Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp  
 25 30 35

ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act gga 226  
 Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly  
 40 45 50

gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa gcc 271  
 Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala  
 55 60 65

aag ctg aag cat gtg gcc agc gac gaa gag gtg gac aag atc gtg 316  
 Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val  
 70 75 80

cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct tat 361  
 Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr  
 85 90 95

gac acc ttc aag gtt att tac gac agt aaa cct gat ttc tct cct 406  
 Asp Thr Phe Lys Val Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro  
 100 105 110

att gat taa ttgttttgta ttgactgaa ttttgacaat aaaggtacta 455  
 Ile Asp  
 115

tcgttatgta aaaaaaaaaa aaaaaa 481

<210> 10

<211> 133

<212> PRT

<213> Tenebrio molitor

<223> Precursor Protein for Clone 3.4

<400> 10

Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala Ile Val Ile Gly Ala  
 -15 -10 -5

Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys  
 1 5 10

Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val  
 15 20 25 30

Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu  
 35 40 45

Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn

50                      55                      60  
 Val Glu Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu  
       65                      70                      75  
 Val Asp Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu  
       80                      85                      90  
 Glu Thr Ala Tyr Asp Thr Phe Lys Val Ile Tyr Asp Ser Lys Pro Asp  
  95                      100                      105                      110  
 Phe Ser Pro Ile Asp  
                     115

<210> 11  
 <211> 115  
 <212> PRT  
 <213> Tenebrio molitor

<223> Mature Protein for Clone 3.4

<400> 11  
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                     20                      25                      30  
 Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu Cys Phe  
                     35                      40                      45  
 Ser Lys Lys Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu  
                     50                      55                      60  
 Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp  
 65                      70                      75                      80  
 Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr  
                     85                      90                      95  
 Ala Tyr Asp Thr Phe Lys Val Ile Tyr Asp Ser Lys Pro Asp Phe Ser  
                     100                      105                      110  
 Pro Ile Asp  
                     115

<210> 12  
 <211> 482  
 <212> DNA  
 <213> Tenebrio molitor

<223> Non-His-tagged, Signal plus, Clone 3.9

<400> 12  
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<213> Tenebrio molitor

<223> Non-his-tagged, Signal plus, Clone 7.5

<400> 15

ggcacgagca aaa atg aaa ctc ctc ttg tgc ttt gcg ttc gcc gcc 46  
Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala  
-15 -10

atc gtc atc gga gct cag gct ctc acc gac gaa cag ata cag aaa 91  
Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys  
-5 1 5

agg aac aag atc agc aaa gag tgc cag cag gtg tcc gga gtg tcc 136  
Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val Ser  
10 15 20

caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gac gat 181  
Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp  
25 30 35

ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act gga 226  
Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly  
40 45 50

gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa gcc 271  
Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala  
55 60 65

aag ctg aag cat gtg gcc agc gac gaa gag gtg gac aag atc gtg 316  
Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val  
70 75 80

cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct tat 361  
Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr  
85 90 95

gac acc ttc aag tgt att tac gac agt aaa cct gat ttc tct cct 406  
Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro  
100 105 110

att gat taa ttgttttgta ttggctgaa ttttgacaat aaaggtacta 455  
Ile Asp  
115

tcgttatgta aaaaaaaaaa aaaaaa 481

<210> 16

<211> 681

<212> DNA

<213> Tenebrio molitor

<223> His-tagged, Signal plus, Clone 2.2

<400> 16

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aaggagatat acc atg ggc agc agc cat cat cat cat cat cac agc	96
Met Gly Ser Ser His His His His His His Ser	
-55 -50	
agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt	141
Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly	
-45 -40 -35	
gga cag caa atg ggt cgc gga tcc gaa ttc gca cga gca aaa atg	186
Gly Gln Gln Met Gly Arg Gly Ser Glu Phe Ala Arg Ala Lys Met	
-30 -25 -20	
aaa ctc ctc ttg tgc ttt gcg ttc gcc gcc atc gtc atc gga gct	231
Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala Ile Val Ile Gly Ala	
-15 -10 -5	
cag gct ctc acc gac gaa cag ata cag aaa agg aac aag atc agc	276
Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser	
1 5 10	
aaa gaa tgc cag cag gtg tcc gga gtg tcc caa gag acg atc gac	321
Lys Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp	
15 20 25	
aaa gtc cgc aca ggt gtc ttg gtc gat gat ccc aaa atg aag aag	366
Lys Val Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys	
30 35 40	
cac gtc ctc tgc ttc tcg aag aaa act gga gtg gca acc gaa gcc	411
His Val Leu Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala	
45 50 55	
gga gac acc aat gtg gag gta ctc aaa gcc aag ctg aag cat gtg	456
Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu Lys His Val	
60 65 70	
gcc agc gac gaa gag gtg gac aag atc gtg cag aag tgc gtg gtc	501
Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys Val Val	
75 80 85	
aag aag gcc aca cca gag gaa acg gct tat gac acc ttc aag tgt	546
Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys Cys	
90 95 100	
att tac gac agt aaa cct gat ttc tct cct att gat taa ttgttttgta	595
Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp	
105 110 115	
tttgactgaa ttttgacaat aaaggtaata tcgttatgta aaaaaaaaaa	645
aaaaaactcg agcaccacca ccaccaccac tgagat	681

<210> 17  
 <211> 173  
 <212> PRT

<213> Tenebrio molitor

<223> Precursor Protein with His-tag, Clone 2.2

<400> 17

Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
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Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
-40 -35 -30

Gly Ser Glu Phe Ala Arg Ala Lys Met Lys Leu Leu Leu Cys Phe Ala  
-25 -20 -15

Phe Ala Ala Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile  
-10 -5 1 5

Gln Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
10 15 20

Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp  
25 30 35

Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly Val  
40 45 50

Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu  
55 60 65 70

Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys  
75 80 85

Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys  
90 95 100

Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp  
105 110 115

<210> 18

<211> 543

<212> DNA

<213> Tenebrio molitor

<223> His-tagged, signal minus, Clone 2.2

<400> 18

ttggttagcgg atggaattcc ctgtagggg ataattttgt ttactttaag 50

aaggagatat acc atg ggc agc agc cat cat cat cat cat cac agc 96  
Met Gly Ser Ser His His His His His His Ser  
-30 -25

agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
-20 -15 -10

gga cag caa atg ggt cgc gga tcc ctc acc gac gaa cag ata cag 186  
 Gly Gln Gln Met Gly Arg Gly Ser Leu Thr Asp Glu Gln Ile Gln  
                   -5                                  1                                  5

aaa agg aac aag atc agc aaa gaa tgc cag cag gtg tcc gga gtg 231  
 Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
                   10                                  15                                  20

tcc caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gat 276  
 Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp  
                   25                                  30                                  35

gat ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act 321  
 Asp Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr  
                   40                                  45                                  50

gga gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa 366  
 Gly Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys  
                   55                                  60                                  65

gcc aag ctg aag cat gtg gcc agc gac gaa gag gtg gac aag atc 411  
 Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile  
                   70                                  75                                  80

gtg cag aag tgc gtg gtc aag aag gcc acc cca gag gaa acg gct 456  
 Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala  
                   85                                  90                                  95

tat gac acc ttc aag tgt att tac gac agt aaa cct gat ttc tct 501  
 Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser  
                   100                                  105                                  110

cct att gat taa ctcgagcacc accaccacca ccactgagat 543  
 Pro Ile Asp  
                   115

<210> 19  
 <211> 149  
 <212> PRT  
 <213> Tenebrio molitor

<223> Mature Protein with His-tag, Clone 2.2

<400> 19  
 Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
                                   -30                                  -25                                  -20

Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
                                   -15                                  -10                                  -5

Gly Ser Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys  
                   1                                  5                                  10

Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val  
   15                                  20                                  25                                  30



cac gtc ctc tgc ttc tcg aag aaa act gga gtg gca acc gaa gcc 411  
 His Val Leu Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala  
 45 50 55  
  
 gga gac acc aat gtg gag gta ctc aaa gcc aag ctg aag cat gtg 456  
 Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu Lys His Val  
 60 65 70  
  
 gcc agc gac gaa gaa gtg gac aag atc gtg cag aag tgc gtg gtc 501  
 Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys Val Val  
 75 80 85  
  
 aag aag gcc aca cca gag gaa acg gct tat gac acc ttc aag tgt 546  
 Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys Cys  
 90 95 100  
  
 att tac gac agt aaa cct gat ttc tct cct att gat taa ttgttttgta 595  
 Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp  
 105 110 115  
  
 ttgtgactgaa ttttgacaat aaaggtacta tcgttatgaa aaaaaaaaaa 645  
  
 aaaaaaactc gagcaccacc accaccacca ctgagat 682

<210> 21  
 <211> 173  
 <212> PRT  
 <213> Tenebrio molitor

<223> Precursor Protein with His-tag, Clone 2.3

<400> 21  
 Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
 -55 -50 -45  
  
 Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
 -40 -35 -30  
  
 Gly Ser Glu Phe Ala Arg Ala Lys Met Lys Leu Leu Leu Cys Phe Ala  
 -25 -20 -15  
  
 Phe Ala Ala Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile  
 -10 -5 1 5  
  
 Gln Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
 10 15 20  
  
 Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp  
 25 30 35  
  
 Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly Val  
 40 45 50  
  
 Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu  
 55 60 65 70



Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys  
                     75                    80                    85  
 Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys  
                     90                    95                    100  
 Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp  
                     105                    110                    115

<210> 22  
 <211> 543  
 <212> DNA  
 <213> Tenebrio molitor

<223> His-tagged, Signal minus, Clone 2.3

<400> 22  
 ttgttagcgg atggaattcc ctcgtagggg ataattttgt ttactttaag 50  
  
 aaggagatat acc atg ggc agc agc cat cat cat cat cat cac agc 96  
                     Met Gly Ser Ser His His His His His His Ser  
                                     -30                                    -25  
  
 agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
 Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
                     -20                    -15                    -10  
  
 gga cag caa atg ggt cgc gga tcc ctc accgac gaa cag ata cag 186  
 Gly Gln Gln Met Gly Arg Gly Ser Leu Thr Asp Glu Gln Ile Gln  
                     -5                    1                    5  
  
 aaa agg aac aag atc agc aaa gaa tgc cag cag gtg tcc gga gtg 231  
 Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
                     10                    15                    20  
  
 tcc caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gat 276  
 Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp  
                     25                    30                    35  
  
 gat ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act 321  
 Asp Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr  
                     40                    45                    50  
  
 gga gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa 366  
 Gly Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys  
                     55                    60                    65  
  
 gcc aag ctg aag cat gtg gcc agc gac gaa gaa gtg gac aag atc 411  
 Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile  
                     70                    75                    80  
  
 gtg cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct 456  
 Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala  
                     85                    90                    95  
  
 tat gac acc ttc aag tgt att tac gac agt aaa cct gat ttc tct 501

Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser  
 100 105 110

cct att gat taa ctcgagcacc accaccacca ccactgagat 543  
 Pro Ile Asp  
 115

<210> 23  
 <211> 149  
 <212> PRT  
 <213> Tenebrio molitor

<223> Mature Protein with His-tag, Clone 2.3

<400> 23  
 Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
 -30 -25 -20

Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
 -15 -10 -5

Gly Ser Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys  
 1 5 10

Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val  
 15 20 25 30

Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu  
 35 40 45

Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn  
 50 55 60

Val Glu Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu  
 65 70 75

Val Asp Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu  
 80 85 90

Glu Thr Ala Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp  
 95 100 105 110

Phe Ser Pro Ile Asp  
 115

<210> 24  
 <211> 776  
 <212> DNA  
 <213> Tenebrio molitor

<223> His-tagged, Signal plus, Tm 13.17

<400> 24  
 ttgttagcgg atggaattcc ctcgtagggg ataattttgt ttactttaag 50

aaggagatat acc atg ggc agc agc cat cat cat cat cat cac agc	96
Met Gly Ser Ser His His His His His His Ser	
-65 -60 -55	
agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt	141
Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly	
-50 -45 -40	
gga cag caa atg ggt cgc gga tcc gaa ttc tgg atc caa aga att	186
Gly Gln Gln Met Gly Arg Gly Ser Glu Phe Trp Ile Gln Arg Ile	
-35 -30 -25	
cgg cac gag act act aag atg aag ttg ctc tgt tgt cta atc tcc	231
Arg His Glu Thr Thr Lys Met Lys Leu Leu Cys Cys Leu Ile Ser	
-20 -15 -10	
ctc att ctg ttg gtc aca gtt cag gcc ctg acc gag gca caa att	276
Leu Ile Leu Leu Val Thr Val Gln Ala Leu Thr Glu Ala Gln Ile	
-5 1 5	
gag aaa ctg aac aag atc agc aaa aaa tgt caa aat gaa agt gga	321
Glu Lys Leu Asn Lys Ile Ser Lys Lys Cys Gln Asn Glu Ser Gly	
10 15 20	
gtg tcg caa gag atc ata acc aaa gct cgc aac ggt gac tgg gag	366
Val Ser Gln Glu Ile Ile Thr Lys Ala Arg Asn Gly Asp Trp Glu	
25 30 35	
gac gat cct aaa ctg aaa cgc caa gtt ttt tgc gtg gcc agg aac	411
Asp Asp Pro Lys Leu Lys Arg Gln Val Phe Cys Val Ala Arg Asn	
40 45 50	
gcc ggt ctg gcc acg gaa tcg gga gag gtg gtg gtc gac gtg ttg	456
Ala Gly Leu Ala Thr Glu Ser Gly Glu Val Val Val Asp Val Leu	
55 60 65	
agg gag aag gtg agg aag gtc act gac aac gac gaa gaa act gag	501
Arg Glu Lys Val Arg Lys Val Thr Asp Asn Asp Glu Glu Thr Glu	
70 75 80	
aaa atc atc aat aag tgc gcc gtc aag aga gat act gtt gaa gag	546
Lys Ile Ile Asn Lys Cys Ala Val Lys Arg Asp Thr Val Glu Glu	
85 90 95	
acg gtg ttc aat act ttc aaa tgt gtc atg aaa aac aag cca aag	591
Thr Val Phe Asn Thr Phe Lys Cys Val Met Lys Asn Lys Pro Lys	
100 105 110	
ttc tca cca gtt gat tga accaccacga ctagtagatg gttcaaattgg	639
Phe Ser Pro Val Asp	
115	
tgtgctttac atataaaaat aaagtgtttc tgatgtaaaa aaaaaaaaaa	689
aaaaaaaaaa aactcgagag tattctagag cggccgcggg cccatcgttt	739



-30

-25

agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
-20 -15 -10

gga cag caa atg ggt cgc ggc ctg acc gag gca caa att gag aaa 186  
Gly Gln Gln Met Gly Arg Gly Leu Thr Glu Ala Gln Ile Glu Lys  
-5 1 5

ctg aac aag atc agc aaa aaa tgt caa aat gaa agt gga gtg tcg 231  
Leu Asn Lys Ile Ser Lys Lys Cys Gln Asn Glu Ser Gly Val Ser  
10 15 20

caa gag atc ata acc aaa gct cgc aac ggt gac tgg gag gac gat 276  
Gln Glu Ile Ile Thr Lys Ala Arg Asn Gly Asp Trp Glu Asp Asp  
25 30 35

cct aaa ctg aaa cgc caa gtt ttt tgc gtg gcc agg aac gcc ggt 321  
Pro Lys Leu Lys Arg Gln Val Phe Cys Val Ala Arg Asn Ala Gly  
40 45 50

ctg gcc acg gaa tcg gga gag gtg gtg gtc gac gtg ttg agg gag 366  
Leu Ala Thr Glu Ser Gly Glu Val Val Val Asp Val Leu Arg Glu  
55 60 65

aag gtg agg aag gtc act gac aac gac gaa gaa act gag aaa atc 411  
Lys Val Arg Lys Val Thr Asp Asn Asp Glu Glu Thr Glu Lys Ile  
70 75 80

atc aat aag tgc gcc gtc aag aga gat act gtt gaa gag acg gtg 456  
Ile Asn Lys Cys Ala Val Lys Arg Asp Thr Val Glu Glu Thr Val  
85 90 95

ttc aat act ttc aaa tgt gtc atg aaa aac aag cca aag ttc tca 501  
Phe Asn Thr Phe Lys Cys Val Met Lys Asn Lys Pro Lys Phe Ser  
100 105 110

cca gtt gat tga ctcgagcacc accaccacca ccaactgagat 543  
Pro Val Asp  
115

<210> 27

<211> 149

<212> PRT

<213> Tenebrio molitor

<223> Mature Protein with His-tag, Tm 13.17

<400> 27

Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
-30 -25 -20

Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
-15 -10 -5

Gly Leu Thr Glu Ala Gln Ile Glu Lys Leu Asn Lys Ile Ser Lys Lys  
 1 5 10 15  
 Cys Gln Asn Glu Ser Gly Val Ser Gln Glu Ile Ile Thr Lys Ala Arg  
 20 25 30  
 Asn Gly Asp Trp Glu Asp Asp Pro Lys Leu Lys Arg Gln Val Phe Cys  
 35 40 45  
 Val Ala Arg Asn Ala Gly Leu Ala Thr Glu Ser Gly Glu Val Val Val  
 50 55 60  
 Asp Val Leu Arg Glu Lys Val Arg Lys Val Thr Asp Asn Asp Glu Glu  
 65 70 75  
 Thr Glu Lys Ile Ile Asn Lys Cys Ala Val Lys Arg Asp Thr Val Glu  
 80 85 90 95  
 Glu Thr Val Phe Asn Thr Phe Lys Cys Val Met Lys Asn Lys Pro Lys  
 100 105 110  
 Phe Ser Pro Val Asp  
 115

<210> 28  
 <211> 681  
 <212> DNA  
 <213> Tenebrio molitor

<223> His-tagged, Signal plus, Clone 3.4

<400> 28  
 ttgttagcgg atggaattcc ctcgtagggg ataattttgt ttactttaag 50  
 aaggagatat acc atg ggc agc agc cat cat cat cat cac agc 96  
 Met Gly Ser Ser His His His His His His Ser  
 -55 -50  
 agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
 Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
 -45 -40 -35  
 gga cag caa atg ggt cgc gga tcc gaa ttc gca cga gca aaa atg 186  
 Gly Gln Gln Met Gly Arg Gly Ser Glu Phe Ala Arg Ala Lys Met  
 -30 -25 -20  
 aaa ctc ctc ttg tgc ttt gct ttc gcc gcc atc gtc atc gga gct 231  
 Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala Ile Val Ile Gly Ala  
 -15 -10 -5  
 cag gct ctc acc gac gaa cag ata cag aaa agg aac aag atc agc 276  
 Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser  
 1 5 10  
 aaa gaa tgc cag cag gtg tcc gga gtg tcc caa gag acg atc gac 321  
 Lys Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp

15	20	25	
aaa gtc cgc aca ggt gtc ttg gtc gac gat ccc aaa atg aag aag			366
Lys Val Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys			
30	35	40	
cac gtc ctc tgc ttc tcg aag aaa act gga gtg gca acc gaa gcc			411
His Val Leu Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala			
45	50	55	
gga gac acc aat gtg gag gta ctc aaa gcc aag ctg aag cat gtg			456
Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu Lys His Val			
60	65	70	
gcc agc gac gaa gag gtg gac aag atc gtg cag aag tgc gtg gtc			501
Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys Val Val			
75	80	85	
aag aag gcc aca cca gag gaa acg gct tat gac acc ttc aag gtt			546
Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys Val			
90	95	100	
att tac gac agt aaa cct gat ttc tct cct att gat taa ttgttttgta			595
Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp			
105	110	115	
tttgactgaa ttttgacaat aaaggtacta tcgttatgta aaaaaaaaaa			645
aaaaaactcg agcaccacca ccaccaccac tgagat			681

<210> 29  
 <211> 173  
 <212> PRT  
 <213> Tenebrio molitor

<223> Precursor protein with His-tag, Clone 3.4

<400> 29  
 Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
                   -55                  -50                  -45  
 Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
                   -40                  -35                  -30  
 Gly Ser Glu Phe Ala Arg Ala Lys Met Lys Leu Leu Leu Cys Phe Ala  
                   -25                  -20                  -15  
 Phe Ala Ala Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile  
                   -10                  -5                  1                  5  
 Gln Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
                   10                  15                  20  
 Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp  
                   25                  30                  35

Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly Val  
40 45 50

Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu  
55 60 65 70

Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys  
75 80 85

Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys  
90 95 100

Val Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp  
105 110 115

<210> 30  
<211> 543  
<212> DNA  
<213> Tenebrio molitor

<223> His-tagged, Signal minus, Clone 3.4

<400> 30  
ttggttagcgg atggaattcc ctcgtagggg ataattttgt ttactttaag 50

aaggagatat acc atg ggc agc agc cat cat cat cat cat cac agc 96  
Met Gly Ser Ser His His His His His His Ser  
-30 -25

agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
-20 -15 -10

gga cag caa atg ggt cgc gga tcc ctc acc gac gaa cag ata cag 186  
Gly Gln Gln Met Gly Arg Gly Ser Leu Thr Asp Glu Gln Ile Gln  
-5 1 5

aaa agg aac aag atc agc aaa gaa tgc cag cag gtg tcc gga gtg 231  
Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
10 15 20

tcc caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gac 276  
Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp  
25 30 35

gat ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act 321  
Asp Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr  
40 45 50

gga gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa 366  
Gly Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys  
55 60 65

gcc aag ctg aag cat gtg gcc agc gac gaa gag gtg gac aag atc 411  
Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile  
70 75 80



gtg cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct 456  
 Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala  
           85                          90                          95

tat gac acc ttc aag gtt att tac gac agt aaa cct gat ttc tct 501  
 Tyr Asp Thr Phe Lys Val Ile Tyr Asp Ser Lys Pro Asp Phe Ser  
           100                          105                          110

cct att gat taa ctcgagcacc accaccacca ccactgagat 543  
 Pro Ile Asp  
           115

<210> 31  
 <211> 149  
 <212> PRT  
 <213> Tenebrio molitor

<223> Mature Protein with His-tag, Clone 3.4

<400> 31  
 Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
                           -30                          -25                          -20

Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
                           -15                          -10                          -5

Gly Ser Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys  
           1                          5                          10

Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val  
 15                          20                          25                          30

Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu  
                           35                          40                          45

Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn  
                           50                          55                          60

Val Glu Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu  
           65                          70                          75

Val Asp Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu  
           80                          85                          90

Glu Thr Ala Tyr Asp Thr Phe Lys Val Ile Tyr Asp Ser Lys Pro Asp  
 95                          100                          105                          110

Phe Ser Pro Ile Asp  
           115

<210> 32  
 <211> 682  
 <212> DNA  
 <213> Tenebrio molitor

<223> His-tagged, Signal plus, Clone 3.9

<400> 32

ttgttagcgg atggaattcc ctcgtagggg ataattttgt ttactttaag 50

aaggagatat acc atg ggc agc agc cat cat cat cat cac agc 96  
Met Gly Ser Ser His His His His His His Ser  
-55 -50

agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
-45 -40 -35

gga cag caa atg ggt cgc gga tcc gaa ttc gca cga gca aaa atg 186  
Gly Gln Gln Met Gly Arg Gly Ser Glu Phe Ala Arg Ala Lys Met  
-30 -25 -20

aaa ctc ctc ttg tgc ttt gct ttc gcc gcc atc gtc atc gga gct 231  
Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala Ile Val Ile Gly Ala  
-15 -10 -5

cag gct ctc acc gat gaa cag ata cag aaa agg aac aag atc agc 276  
Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser  
1 5 10

aaa gaa tgc cag cag gag tcc gga gtg tcc caa gag acg atc gac 321  
Lys Glu Cys Gln Gln Glu Ser Gly Val Ser Gln Glu Thr Ile Asp  
15 20 25

aaa gtc cgc aca ggt gtc ttg gtc gac gat ccc aaa atg aag aag 366  
Lys Val Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys  
30 35 40

cac gtc ctc tgc ttc tcg aag aga act gga gtg gca acc gaa gcc 411  
His Val Leu Cys Phe Ser Lys Arg Thr Gly Val Ala Thr Glu Ala  
45 50 55

gga gac acc aat gtg gag gta ctc aaa gcc aag ctg aag cat gtg 456  
Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu Lys His Val  
60 65 70

gcc agc gac gaa gaa gtg gac aag atc gtg cag aag tgc gtg gtc 501  
Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys Val Val  
75 80 85

aag aag gcc aca cca gag gaa acg gct tat gac acc ttc aag tgt 546  
Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys Cys  
90 95 100

att tac gac agt aaa cct gat ttc tct cct att gat taa ttgttttgta 595  
Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp  
105 110 115

tttgactgaa ttttgacaat aaaggacta tcgttatgaa aaaaaaaaaa 645

aaaaaaactc gagcaccacc accaccacca ctgagat 682



agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
 Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
                   -20                  -15                  -10

gga cag caa atg ggt cgc gga tcc ctc acc gat gaa cag ata cag 186  
 Gly Gln Gln Met Gly Arg Gly Ser Leu Thr Asp Glu Gln Ile Gln  
                   -5                  1                  5

aaa agg aac aag atc agc aaa gaa tgc cag cag gag tcc gga gtg 231  
 Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Glu Ser Gly Val  
                   10                  15                  20

tcc caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gac 276  
 Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp  
                   25                  30                  35

gat ccc aaa atg aag aag cac gtc ctc tgc ttc tgc aag aga act 321  
 Asp Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Arg Thr  
                   40                  45                  50

gga gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa 366  
 Gly Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys  
                   55                  60                  65

gcc aag ctg aag cat gtg gcc agc gac gaa gaa gtg gac aag atc 411  
 Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile  
                   70                  75                  80

gtg cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct 456  
 Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala  
                   85                  90                  95

tat gac acc ttc aag tgt att tac gac agt aaa cct gat ttc tct 501  
 Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser  
                   100                  105                  110

cct att gat taa ctgagcacc accaccacca ccaactgagat 543  
 Pro Ile Asp  
                   115

<210> 35  
 <211> 149  
 <212> PRT  
 <213> Tenebrio molitor

<223> Mature Protein with His-tag, Clone 3.9

<400> 35  
 Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
                   -30                  -25                  -20

Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
                   -15                  -10                  -5

Gly Ser Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys

1                      5                      10  
 Glu Cys Gln Gln Glu Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val  
 15                      20                      25                      30  
 Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu  
                     35                      40                      45  
 Cys Phe Ser Lys Arg Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn  
                     50                      55                      60  
 Val Glu Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu  
                     65                      70                      75  
 Val Asp Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu  
                     80                      85                      90  
 Glu Thr Ala Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp  
 95                      100                      105                      110  
 Phe Ser Pro Ile Asp  
                     115

<210> 36  
 <211> 681  
 <212> DNA  
 <213> Tenebrio molitor

<223> His-tagged, Signal plus, Clone 7.5

<400> 36  
 ttgttagcgg atggaattcc ctcgtagggg ataattttgt ttactttaag 50  
 aaggagatat acc atg ggc agc agc cat cat cat cat cat cac agc 96  
                     Met Gly Ser Ser His His His His His His Ser  
    -55                      -50  
 agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt 141  
 Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
                     -45                      -40                      -35  
 gga cag caa atg ggt cgc gga tcc gaa ttc gca cga gca aaa atg 186  
 Gly Gln Gln Met Gly Arg Gly Ser Glu Phe Ala Arg Ala Lys Met  
                     -30                      -25                      -20  
 aaa ctc ctc ttg tgc ttt gcg ttc gcc gcc atc gtc atc gga gct 231  
 Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala Ile Val Ile Gly Ala  
                     -15                      -10                      -5  
 cag gct ctc acc gac gaa cag ata cag aaa agg aac aag atc agc 276  
 Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser  
                     1                      5                      10  
 aaa gag tgc cag cag gtg tcc gga gtg tcc caa gag acg atc gac 321  
 Lys Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp  
                     15                      20                      25

aaa gtc cgc aca ggt gtc ttg gtc gac gat ccc aaa atg aag aag 366  
 Lys Val Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys  
 30 35 40

cac gtc ctc tgc ttc tcg aag aaa act gga gtg gca acc gaa gcc 411  
 His Val Leu Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala  
 45 50 55

gga gac acc aat gtg gag gta ctc aaa gcc aag ctg aag cat gtg 456  
 Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu Lys His Val  
 60 65 70

gcc agc gac gaa gag gtg gac aag atc gtg cag aag tgc gtg gtc 501  
 Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys Val Val  
 75 80 85

aag aag gcc aca cca gag gaa acg gct tat gac acc ttc aag tgt 546  
 Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys Cys  
 90 95 100

att tac gac agt aaa cct gat ttc tct cct att gat taa ttgttttgta 595  
 Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp  
 105 110 115

tttggtgaa ttttgacaat aaaggtacta tcgttatgta aaaaaaaaaa 645

aaaaaactcg agcaccacca ccaccaccac tgagat 681

<210> 37  
 <211> 173  
 <212> PRT  
 <213> Tenebrio molitor

<223> Precursor Protein with His-tag, Clone 7.5

<400> 37  
 Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
 -55 -50 -45

Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
 -40 -35 -30

Gly Ser Glu Phe Ala Arg Ala Lys Met Lys Leu Leu Leu Cys Phe Ala  
 -25 -20 -15

Phe Ala Ala Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile  
 -10 -5 1 5

Gln Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
 10 15 20

Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp

25                      30                      35  
 Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly Val  
     40                      45                      50  
 Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala Lys Leu  
     55                      60                      65                      70  
 Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile Val Gln Lys Cys  
                     75                      80                      85  
 Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala Tyr Asp Thr Phe Lys  
                     90                      95                      100  
 Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser Pro Ile Asp  
                     105                      110                      115

<210> 38  
 <211> 543  
 <212> DNA  
 <213> Tenebrio molitor

<223> His-tagged, Signal minus, Clone 7.5

<400> 38  
     ttggttagcgg atggaattcc ctcgtagggg ataattttgt ttactttaag                      50  
 aaggagatat acc atg ggc agc agc cat cat cat cat cat cac agc                      96  
                     Met Gly Ser Ser His His His His His His Ser  
     -30                      -25  
 agc ggc ctg gtg ccg cgc ggc agc cat atg gct agc atg act ggt                      141  
 Ser Gly Leu Val Pro Arg Gly Ser His Met Ala Ser Met Thr Gly  
                     -20                      -15                      -10  
 gga cag caa atg ggt cgc gga tcc ctc acc gac gaa cag ata cag                      186  
 Gly Gln Gln Met Gly Arg Gly Ser Leu Thr Asp Glu Gln Ile Gln  
                     -5                      1                      5  
 aaa agg aac aag atc agc aaa gag tgc cag cag gtg tcc gga gtg                      231  
 Lys Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val  
                     10                      15                      20  
 tcc caa gag acg atc gac aaa gtc cgc aca ggt gtc ttg gtc gac                      276  
 Ser Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp  
                     25                      30                      35  
 gat ccc aaa atg aag aag cac gtc ctc tgc ttc tcg aag aaa act                      321  
 Asp Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr  
                     40                      45                      50  
 gga gtg gca acc gaa gcc gga gac acc aat gtg gag gta ctc aaa                      366  
 Gly Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys  
                     55                      60                      65  
 gcc aag ctg aag cat gtg gcc agc gac gaa gag gtg gac aag atc                      411

Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu Val Asp Lys Ile  
70 75 80

gtg cag aag tgc gtg gtc aag aag gcc aca cca gag gaa acg gct 456  
Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala  
85 90 95

tat gac acc ttc aag tgt att tac gac agt aaa cct gat ttc tct 501  
Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser  
100 105 110

cct att gat taa ctcgagcacc accaccacca ccaactgagat 543  
Pro Ile Asp  
115

<210> 39  
<211> 149  
<212> PRT  
<213> Tenebrio molitor

<223> Mature protein with His-tag, Clone 7.5

<400> 39  
Met Gly Ser Ser His His His His His His Ser Ser Gly Leu Val Pro  
-30 -25 -20

Arg Gly Ser His Met Ala Ser Met Thr Gly Gly Gln Gln Met Gly Arg  
-15 -10 -5

Gly Ser Leu Thr Asp Glu Gln Ile Gln Lys Arg Asn Lys Ile Ser Lys  
1 5 10

Glu Cys Gln Gln Val Ser Gly Val Ser Gln Glu Thr Ile Asp Lys Val  
15 20 25 30

Arg Thr Gly Val Leu Val Asp Asp Pro Lys Met Lys Lys His Val Leu  
35 40 45

Cys Phe Ser Lys Lys Thr Gly Val Ala Thr Glu Ala Gly Asp Thr Asn  
50 55 60

Val Glu Val Leu Lys Ala Lys Leu Lys His Val Ala Ser Asp Glu Glu  
65 70 75

Val Asp Lys Ile Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu  
80 85 90

Glu Thr Ala Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp  
95 100 105 110

Phe Ser Pro Ile Asp  
115

<210> 40  
<211> 24



<212> DNA  
 <213> Tenebrio molitor  
  
 <223> Tm 12.84 upper primer with Bam-H1 site (Clones 2.2, 2.3, 3.4, 3.9, and 7.5)  
  
 <400> 40  
 cgcggtatccc tcaccgacga acag 24  
  
 <210> 41  
 <211> 25  
 <212> DNA  
 <213> Tenebrio molitor  
  
 <223> Tm 12.84 lower primer with Xho1 site (Clones 2.2, 2.3, 3.4, 3.9, and 7.5)  
  
 <400> 41  
 gagaggataa ctaattgagc tcgcc 25  
  
 <210> 42  
 <211> 24  
 <212> DNA  
 <213> Tenebrio molitor  
  
 <223> Tm 13.17 upper primer with Bam-H1 site  
  
 <400> 42  
 cgcggtatccc tgaccgaggc acaa 24  
  
 <210> 43  
 <211> 25  
 <212> DNA  
 <213> Tenebrio molitor  
  
 <223> Tm 13.17 lower primer with Xho1 site  
  
 <400> 43  
 gagtgggtcaa ctaactgagc tcgcc 25  
  
 <210> 44  
 <211> 481  
 <212> DNA  
 <213> Tenebrio molitor  
  
 <220>  
 <221> misc\_feature  
 <222>  
 <223> Consensus of the Tm 12.84 Isoforms, 'n' defined as any nucleotide, 'Xaa' defined as any amino acid.  
  
 <400> 44  
 ggcacgagca aaa atg aaa ctc ctc ttg tgc ttt gcn ttc gcc gcc 46

8

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<210> 45
<211> 484
<212> DNA
<213> Tenebrio molitor

<220>
<221> misc_feature
<222>
<223> Consensus of Seq ID #44 with Tm 13.17, 'n' defined as any nucleotide,
'Xaa' defined as any amino acid

<400> 45
ggcanrnnnnn aar atg aar ytn ctc tnn tgy ytn ryn tyc nyc ryy          46
           Met Lys Leu Leu Xaa Cys Phe Ala Phe Ala Ala
                   -15                      -10

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ntn ntn rtc rna gyt cag gcy ctn acc gan-gna car atn nag aaa	91
Xaa Xaa Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys	
-5 1 5	
 nng aac aag atc agc aaa rar tgy car nan gnr nny gga gtg tcn	136
Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val Ser	
10 15 20	
 caa gag ayn atn rnc aaa gyy cgc ann ggt gnc tng gnn gay gat	181
Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp	
25 30 35	
 ccy aaa ntg aar nrn can gty yty tgc ntn ncn arg arn rcy ggn	226
Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly	
40 45 50	
 ntg gcn acn gaa ncn gga gan ryn rnn gtn gan gtr ytn arr gnn	271
Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala	
55 60 65	
 aag ntg arg nan gtn rcy rrc aac gac gaa gar ryn gan aar atc	316
Lys Leu Lys His Val Ala Ser Asn Asp Glu Glu Val Asp Lys Ile	
70 75 80	
 rtn nan aag tgc gyn gtc aag arr gny acn nyn gar gar acg gyn	361
Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala	
85 90 95	
 tny ray acy ttc aar nnt rty nnn ran ary aar ccn ran ttc tcn	406
Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser	
100 105 110	
 ccn rtt gat tra nynnnyynnna ytnngnnnrnr nttyranaat aaagnnnntn	458
Pro Ile Asp	
115	
 tnrtnnnrna aaaaaaaaaa aaaaaa	484

<210> 46

<211> 484

<212> DNA

<213> Tenebrio molitor

<220>

<221> misc\_feature

<222>

<223> Consensus of Seq ID #45 with B1/B2, 'n' defined as any nucleotide, 'Xaa' defined as any amino acid,

<400> 46

ggcanrnnnn aar atg aar ytn ctc tnn tgy ytn ryn tyy nyc ryy	46
Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala	
-15 -10	

ntn ntn rtc nna gyt cag gcy ntn acy nan gna nan ntn nag nna Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys -5 1 5	91
nng nnc nar ayc agc rna rar tgy nar nnn gnr nny gga gtg tcn Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Val Ser Gly Val Ser 10 15 20	136
naa gan ryn atn rnn ara gyy cgc ann ggt gnc tng gnn gay gay Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp 25 30 35	181
ccy aaa ntg aar nnn can nty yty tgc ntn nyn arg rnn nyy grn Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly 40 45 50	226
ntr gyn rcn gaa ncn gga gan ryn rnn gyn gan ryr ytn arr gnn Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala 55 60 65	271
aag ntg ang nrn nnn nnn rnn ann rnn rar rar ryn rnn arr ntn Lys Leu Lys His Val Ala Ser Asn Asp Glu Glu Val Asp Lys Ile 70 75 80	316
nyn nrn arn nnn nnn nnn nng arn rnn nyn nnn rar rnn nnn nnn Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala 85 90 95	361
tnn ran nyn yyn aan nnn nny nnn rnn ann arn ccn rnn tyy tyn Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser 100 105 110	406
cnr ryt rnt trn nnnnnnnnnn ynnnnnnrnr nttyranaat aaagnnnytn Pro Ile Asp 115	458
tnrtnnrna aaaaaaaaaa aaaaaa	484

<210> 47  
 <211> 484  
 <212> DNA  
 <213> Tenebrio molitor

<220>  
 <221> misc\_feature  
 <222>  
 <223> Consensus of SEQ. ID #46 with AFP-3, 'n' defined as any nucleotide,  
 'Xaa' defined as any amino acid

<400> 47 ggcnnrnnnn aar atg aar ytn ctc ynn tgy ytn ryn yyy nyy ryy Met Lys Leu Leu Leu Cys Phe Ala Phe Ala Ala -15 -10	46
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ntn ntn ryc nnr ryy yan gcy ntn acy nan rna nnn nnn nag nnr	91
---	----

Ile Val Ile Gly Ala Gln Ala Leu Thr Asp Glu Gln Ile Gln Lys	
-5 1 5	
nng nny nar nnc agc rnn rnn tgy nar nnn gnr nny gga gtr tcn	136
Arg Asn Lys Ile Ser Lys Glu Cys Gln Gln Glu Ser Gly Val Ser	
10 15 20	
naa gan nyn ntn rnn arr gyy cgc ann ngd gnn nnr gnn gay gay	181
Gln Glu Thr Ile Asp Lys Val Arg Thr Gly Val Leu Val Asp Asp	
25 30 35	
ccy aaa ntg aar nnn can nyy yty tgc ntn nyn arg rnn nyy grn	226
Pro Lys Met Lys Lys His Val Leu Cys Phe Ser Lys Lys Thr Gly	
40 45 50	
ntn ryn rnn gnn nnn ggn gan nyn nnn nyn gan nnn ntn arr rnn	271
Val Ala Thr Glu Ala Gly Asp Thr Asn Val Glu Val Leu Lys Ala	
55 60 65	
aar ntn ang nrr nnn nnn rnn rnn nnn rar rar ryn rrn rrn ntn	316
Lys Leu Lys His Val Ala Ser Asn Asp Glu Glu Val Asp Lys Ile	
70 75 80	
nyn nnn arn nnn nnn nnn nng arn rnn nyn nnn nar nnn nnn nnn	361
Val Gln Lys Cys Val Val Lys Lys Ala Thr Pro Glu Glu Thr Ala	
85 90 95	
nnn ran nyn yyn aan nnn nny nnn rrr ann arn ycn nnn tnn nnn	406
Tyr Asp Thr Phe Lys Cys Ile Tyr Asp Ser Lys Pro Asp Phe Ser	
100 105 110	
cnn nyn rnn trn nnnnnnnnnn ynnrrnnnnnn nnnnnnnnaat aaannnnnnn	458
Pro Ile Asp	
115	
nnnnnnnnna aaaaaaaaaa aaaaaa	484

<210> 48  
 <211> 136  
 <212> PRT  
 <213> Tenebrio molitor  
  
 <220>  
 <221> misc\_feature  
 <222>  
 <223> General Consensus of Clones, B1, B2 and AFP-3, 'n' defined as any nucleotide, 'Xaa' defined as any amino acid  
  
 <400> 48  
 Met Lys Leu Leu Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
 -15 -10 -5  
  
 Xaa Ala Xaa Thr Xaa Xaa Xaa Xaa Glx Xaa Xaa Xaa Xaa Xaa Ser Xaa  
 1 5 10

[illegible]